CLAIMS

1. A method of maintaining an effective corrosion-inhibiting amount of oxygen scavenger or oxygen in a hot water system comprising

(i) determining range of oxidation-reduction potentials for effective corrosion inhibition for the system at system temperature, pressure and pH;

(ii) measuring the oxidation-reduction potential of the water in the system at temperature and pressure; and

(iii) adding oxygen or oxygen scavenger to the system to maintain the oxidation-reduction potential of the water within the predetermined range of oxidation-reduction potentials.

2. The method of claim 1 wherein the hot water system is an industrial boiler system.

3. The method of claim 2 wherein an oxygen scavenger is added to the hot water system.

4. The method of claim 3 wherein the range of oxidation-reduction potentials is from about -0.7 V to about -0.3 V at 400 °F vs silver/silver chloride external pressure balanced reference electrode.

5. The method of claim 4 wherein the oxygen scavenger is selected from the group consisting of hydrazine, sodium sulfite, carbohyrazide, *N,N*-diethylhydroxylamine, hydroquinone, erythorbate, methyl ethyl ketoxime, hydroxylamine, tartronic acid, ethoxyquin, methyltetrazone, tetramethylphenylenediamine, semi-carbazides, DEAE 2-ketogluconate, *N*-isopropylhydroxylamine, ascorbic acid, gallic acid and hydroxyacetone.

6. The method of claim 5 wherein the oxygen scavenger is added to the industrial boiler feed water and condensate system.

7. The method of claim 6 wherein the feed water and condensate system is an all carbon steel system having a pH of about 8 to about 10.

8. The method of claim 7 wherein the oxygen scavenger is sodium sulfite and the range of oxidation-reduction potentials is from about -0.65 V to about -0.5 V at 400 °F vs silver/silver chloride external pressure balanced reference electrode (0.1N KCl filling solution).

9. The method of claim 7 wherein the oxygen scavenger is carbohydrazide and the range of oxidation-reduction potentials is from about -0.6 V to about -0.45 V at 400 °F vs silver/silver chloride external pressure balanced reference electrode (0.1N KCl filling solution).

10. The method of claim 7 wherein the oxygen scavenger is erythorbic acid and the range of oxidation-reduction potentials is from about -0.6 V to about -0.35 V at 400 °F vs silver/silver chloride external pressure balanced reference electrode (0.1N KCl filling solution).

11. The method of claim 6 wherein the feed water and condensate system is a mixed metallurgy system containing copper and having a pH of about 8 to about 10.

12. The method of claim 11 wherein the range of oxidation-reduction potentials is from about -0.65 V to about -0.5 V at 400 °F vs silver/silver chloride external pressure balanced reference electrode (0.1N KCl filling solution) at a pH of about 9.2 to about 9.5.

13. The method of claim 2 wherein the industrial boiler system is an all ferrous system having a pH of about 9.2 to about 9.5.

14. The method of claim 12 wherein oxygen is added to the system.

15. The method of claim 14 wherein the range of oxidation-reduction potentials is from about 0 V to about 0.3 V at 400 °F vs silver/silver chloride external pressure balanced reference electrode (0.1N KCl filling solution).

16. A method of inhibiting corrosion of the metal surfaces of a hot water system comprising

(i) adding an effective corrosion inhibiting amount of oxygen or one or more oxygen scavengers to the system;

(ii) measuring the oxidation-reduction potential of the water in the system at temperature and pressure; and

(iii) adding oxygen or oxygen scavenger to the system to maintain the effective amount of oxygen or oxygen scavengers in the system based on the measured oxidation-reduction potential of the water.

17. The method of claim 16 wherein the measuring of oxidation-reduction potentials and addition of oxygen or oxygen scavengers is performed continuously.

18. The method of claim 16 wherein the measuring of oxidation-reduction potentials and addition of oxygen or oxygen scavengers is performed intermittently.

19. A method of inhibiting corrosion of the metal surfaces of a hot water system comprising

(i) determining range of oxidation-reduction potentials for effective corrosion inhibition for the system at system temperature, pressure and pH;

(ii) adding oxygen or one or more oxygen scavengers to the system to bring the system oxidation-reduction potential within the predetermined range;

(iii) continuously or intermittently measuring the oxidation-reduction potential of the water in the system; and

(iv) adding oxygen or oxygen scavengers to maintain the measured system oxidation-reduction potential within the predetermined range.

20. A cell for measuring the oxidation-reduction potential of a flowing water stream in a hot water system at temperature and pressure comprising two thermocouples, a silver-silver chloride reference electrode and a platinum electrode, wherein one thermocouple measures the temperature of the cell and the other thermocouple measures the cold junction temperature of the silver-silver chloride reference electrode.